PORSF
11.3.31.5.1

November 30, 2000

TO: Denise Rennis
Port of Portland
121 NW Everett
Portland, Oregon 97209

FROM: Mark Vlahakis
Soil Scientist

SUBJECT: T-5 Groundwater Investigation - Phase 2

Denise:
This memo details the results of the Port's T-5 wetland mitigation site's Phase 2 groundwater investigation. An approximately one acre expansion of the T-5 mitigation area is proposed in an area north of the existing "Long Pond" mitigation site (see attached site plan). Due to complex hydrology encountered in the existing adjacent mitigation areas, the current groundwater elevation monitoring study was initiated to determine the seasonal depth to shallow groundwater within the proposed expansion area.

A previous groundwater elevation study was conducted in 1999 at a proposed expansion area west and north of the existing "Lower Pond" mitigation area. Depth to seasonal groundwater in this area ranged from 9 to 19 feet below the ground surface, with excavation depths estimated at between 10 and 15 feet of the overlying sands in order to achieve seasonal wetland hydrology. An FES technical memo to the Port dated September 18, 1999, detailed the well installation and groundwater elevation study results.

On March 6, 2000, three shallow groundwater monitoring wells were installed in the proposed Phase 2 expansion area by a licensed well driller. The purpose of the wells was to be able to accurately measure the shallow groundwater levels in the proposed Phase 2 expansion area. In addition, soil conditions could be visually assessed during the drilling operation. The wells (OW-5 through OW-7) were installed to approximately 20 feet below the ground surface (bgs). The 2-inch diameter PVC wells consisted of solid casing from the surface to a depth of approximately 4.5 feet bgs, and screened casing from 5 feet to the bottom of the well at approximately 20 feet bgs. The wells were fitted with surface flush-mount protective monuments. Please refer to the attached site plan for approximate well locations.

INSTALLATION AND MONITORING RESULTS

Soil cuttings observed during the drilling operation indicate that loose sands were present in all three borings from the ground surface to depths ranging from 17 to 20 feet bgs. The boring for Well OW-5 consisted of brown and gray loose sands from the ground surface to approximately 17 feet bgs, where gray silts and silty clays were encountered to the bottom of the boring (approximately 20 feet bgs). The boring for Well OW-6 consisted of brown and gray loose sands from the ground surface to approximately 20 feet bgs, where a dark gray silty sand was

encountered at the very bottom (adhered on the auger teeth). The boring for Well OW-7 contained brown and gray loose sands from the ground surface to approximately 18 feet, where a dark gray slightly silty sand was encountered to the bottom of the boring (approximately 20 feet bgs).

Water levels were recorded by Port personnel using an electronic water level indicator, measuring the top of the groundwater surface in feet from the top of the well casing (the top of the well casing approximated the adjacent ground surface). The following table presents groundwater levels recorded at the proposed Phase 2 expansion site from March through early October 2000.

T-5 GROUNDWATER DATA - PHASE 2

Date (2000)	OW-5	OW-6	OW-7
March 6*	6.82	4.50	4.15
March 20	6.65	4.86	5.23
April 5	7.11	5.22	5.35
April 20	7.45	5.60	5.02
May 1	7.67	5.71	5.15
May 30	8.35	6.42	5.77
July 27	9.60	7.60	6.92
August 28	10.22	8.17	7.75
September 11	10.43	8.42	7.93
October 13	10.80	8.90	8.35
October 19	10.88	8.88	8.32

Note: all measurements approximate in feet below the ground surface (well casings not surveyed for elevation)

* water levels recorded during well installation

DISCUSSION

Based on the recorded water levels and the existing soils, it appears that excavation of between 5 to 8 feet of the overlying sandy material would be necessary in order to achieve the requisite wetland hydrology at the proposed Phase 2 expansion site. The sandy material remaining after excavation would provide little, if any, capillary action to bring water upwards toward the surface, due to the apparent lack of silt and clay minerals in the existing sands.

Visually, it appears that the groundwater elevations at the Phase 2 study area are similar to the surface water elevations that exist at the Long Pond mitigation area, nearby to the south. This observation would need to be confirmed with a ground elevation survey.

Shallow groundwater at the site is somewhat influenced by the nearby Willamette River. In conjunction with the previous 1999 groundwater elevation study, it appears that the shallow groundwater "dives" to the river as it approaches the shoreline (note: the river level appears to be approximately 15 to 25 feet below the site's ground surface). At the Phase 2 area, groundwater elevations drop approximately 2.5 feet in 600 linear feet from the east end of the site (OW-7) to the western portion (OW-5). This drop in groundwater elevation appears somewhat gradual in the eastern portion (between OW-6 and OW-7), and more abrupt in the western portion (between OW-5 and OW-6).